A Cost-Analysis of Health Services Delivery in Ichilo Province, Bolivia

A report to:
International Eye Foundation
and
Centro de Promocion Agropecuaria Campesina
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Table of Contents

Acronyms

CEA	Cost-Effectiveness Analysis
CEPAC	Centro de Promocion Agropecuaria Campesina
CSP	Child Survival Projects
HQ	Headquarters
IEF	International Eye Foundation
PAI	Immunizations
RDA	Recommended Daily Allowance
SNIS	National Health Information System
RPS	Volunteer Community Health Personnel
USAID	United States Agency for International Development
VA	Vitamin A
VAC	Vitamin A Capsules

Executive Summary

Introduction:

This study was undertaken to assist CEPAC in understanding the costs associated with their delivery of health services in the Yapacani Municipality of Bolivia, in preparation for a substantial expansion of services into the other Municipalities that comprise the Ichilo Province, along with an evaluation of strategies employed to deliver those services. The analysis includes both retrospective and prospective components and is designed not to simply be used as a one time source of information, but rather as a model to assist CEPAC in completing similar analysis in the future. In addition to this report CEPAC personnel received informal training in the methods used and described here.

CEPAC currently delivers services through three channels: A clinic, a mobile team and health festivals. Each of these channels was analyzed systematically. Additionally observations regarding CEPAC's general data collecting and reporting practices are also included here.

Key Findings and Recommendations:

Mobile Team:

- The Mobile team represents the greatest opportunity for efficiency improvements through two key changes
  - Less frequent visits to each community would allow the same resources to serve more than three times the number of people. This change alone could allow CEPAC to reach the 80% coverage targets for PAI/VA
  - Reducing the size of the team could reduce direct costs by nearly half.

Taken together these two changes would reduce the per unit cost of providing care by 85%, while greatly improving the health of the population. Additionally all of the analysis was done using Yapacani, the largest of the three municipalities being served, as a model. It is quite likely that further saving/service enhancements can be realized as these results are generalized to the two smaller municipalities.

- Cost recovery in the rural population served by the mobile team would appear to present a significant challenge

Festivals:

- A prospective analysis of the festivals suggests that approximately 78 individuals need to receive care at the average festival for their cost-effectiveness to match that of the mobile team
- If festival attendance greatly exceeds 78 then moving resources from the mobile teams to festivals should be evaluated

Clinic:

- Data from the clinic are not comparable with data from the mobile team because the clinic serves a primarily urban population, while the mobile team serves a primarily rural population. However the results my be used to asses clinic efficiency on a year to year basis
- Cost recovery in the clinic is very much a possibility

Data Collection and Reporting:

- The data collection and reporting systems of CEPAC are not well standardized or optimized for ease of use
  - Most important data is collected, but not necessarily in a well defined, systematic manner
  - Data collected is not consistent from year to year
  - A great deal of data is never collated or reported to individuals that could use it to inform decision making
  - A great deal of data still exists only in hard copy format

Background:

In September of 1999 the International Eye Foundation was awarded a $1 million, USAID funded, Child Survival grant. IEF will be partnering with CEPAC in the execution of the project. The project design calls for CEPAC's extensive regional infrastructure, experience and reputation for delivering high quality care, to be combined with IEF's more than ten years of CS experience, to expand health care services to the entire district of Ichilo. As part of this expansion IEF will work with CEPAC to develop new, population focused tactics to achieve substantially higher coverage rates for several key interventions, with immediate attention focused on immunization (PAI) and vitamin A capsule distribution (VA). This analysis was carried out with three objectives in mind:

1. Help CEPAC to understand, retrospectively, the resources expended in the provision of services, with special attention given to the relative efficiency of various channels of service delivery.
2. Plan cost scenarios prospectively, given various tactical decisions, in order to inform and optimize the expansion of services.
3. Build the capacity of CEPAC to use CEA in their everyday decision making.

Additionally, significant time was spent gathering data from medical and administrative personnel and every opportunity was taken to build CEPAC's capacity to collect and report data in the most systematic, practical and efficient manner possible.

Population:

Ichilo District, is a sparsely populated, mostly rural district within the Department of Santa Cruz, with a total population of 52,780. Ichilo is comprised of three Municipalities: Yapacani—where CEPAC has been working for several years--San Carlos and Buena Vista. Within Ichilo it is estimated that 12,667 individuals are members of the CS target population defined as children five years of age and under, and women of child bearing age (15-49 years). The limited transportation infrastructure within the province, the low quality of many of the existing roads, and the presence of many rivers prone to frequent flooding create a significant logistical challenge in the delivery of health services. According to data obtained from the baseline KPC survey, health indicators in Ichilo are substantially worse than in the rest of the Department of Santa Cruz, and worse than Bolivian national averages.

	Ichilo Province	Dept. of Santa Cruz	National
Under 5 mortality	104	79	105
Prevalence of Diarrhea	38%	--	19%
Malnutrition (wt/age)	34%	24%	8%
Malnutrition (ht/age)	55%	22%	27%
Malnutrition (wt/ht)	15%	10%	1%

The Project:

Currently CEPAC delivers health services to thirty of the one hundred five communities that comprise the Municipality of Yapacani. This is accomplished through three related but distinct mechanisms: A clinic based in urban Yapacani; a mobile medical team that travels daily to hold a clinic in a single community; health festivals held weekends in communities around Yapacani that draw patients from several communities. These festivals are serviced by the mobile medical team as well as some of the medical personnel from the clinic. Historically these services have been available only in Yapacani. However, as part of the CS program two additional mobile unites have been procured and staffed to serve communities in Buena Vista and San Carlos. All analysis was done using Yapacani data. The results can be generalized to the other two municipalities.

Data:

All data examined for the clinic and the mobile team were for calendar year 1999. Because the festivals are a new initiative no 1999 data is available. Data from 2000 was used.

Financial: All of the financial data used in this analysis taken from the CEPAC accounting systems and supplied by Omar Miranda, CEPAC's senior financial manager. All wage information represents actual costs. Some costs, such as monthly vehicle maintenance are estimates made in conjunction with Mr. Miranda based on historical data and/or personal experience. CEPAC's accounting system appears to be well designed, maintained and organized. The necessary data was extracted with little trouble and appears to be highly reliable. In the case of the festivals 1999 actual expenditures did not exist, as such 2000 budget figures were used instead. CEPAC personnel believe the budget to be a reliable estimate of actual costs.

Coverage: The majority of coverage data was gathered through a series of meetings with CEPAC medical personnel, primarily CEPAC's Medical Director, Dr. Mabel Morales. Perhaps owing to various and changing requirements from the MOH and funding organizations, CEPAC's

systems for collecting and reporting data appear to be of inconsistent quality. There is no centralized, comprehensive data repository; little standardization in either collection or reporting methodologies; a continued reliance on hard copy formats; changing collection patterns from year to year. The quality of the clinic data extracted for use in this analysis is adequate and generally reliable, though it was possible only at the expense of significant time and effort on the part of project personnel. The quality of the data extracted for the Mobile Team is questionable, but probably adequate for broadly defined analysis. There were many missing data points and unexplained data patterns that could reflect reality, but more likely reflect problems in the collection or reporting of the data itself. The data extracted for the festival coverage was not adequate and therefor in lieu of analysis parallel to that performed for the Clinic and Mobile Team, a breakeven model was created which provides a festival attendance benchmark and which may be used when more reliable data is available.

Methods:

Each of the three care delivery mechanisms was analyzed independently. Given that they serve different populations and different medical purposes the results are not directly comparable. For example, though it is cheaper to treat an individual in the clinic than with the mobile team, the conclusion cannot not be drawn that the mobile teams ought to be discontinued in favor of more clinics because the clinic is located in the most densely populated area of Ichilo. The CE results of the Yapacani clinic therefore can not be generalized to the more remote areas of Ichilo.

Patient contacts was determined to be the most valuable coverage indicator to analyze. (Several permutations of this indicator are included in the analysis, see details below.) This will help CEPAC understand the relative costs of making contact with patients in the various settings. This information will be valuable to CEPAC as they introduce new strategies to meet the coverage targets of the CS proposal.

However before the analysis of the specific initiatives was completed, a basic top-line analysis was done to provide gross benchmarks for future spending. The entire annual budget was simply divided first by the entire population of the region and second by the total number of target population members. These results serve to demonstrate the per individual resources available depending upon whether CEPAC continues to serve the entire population, or to focus on the target population exclusively.

Clinic: Direct Costs included in the analysis include all costs associated with delivering health services at the clinic. The largest costs (78%), as would be expected, is personnel including physicians. Other costs include depreciation on medical equipment, all the costs of maintaining an

ambulance service as well as the costs of disposables. This totaled $33,859. No capital or maintenance costs for the structure itself is included (though it is estimated to be less than 10% of total costs) This number should be estimated and included in any study of the sustainability of clinic services. Indirect costs were determined as a percentage of CEPAC HQ costs as allocated to the various interventions and totaled $6,647. (Allocated indirect costs do not sum to 100% because health is only one part of CEPAC's activities. Food security and agricultural production is the others.) The coverage data was hand tabulated from hard copies of required MOH reporting forms (SNIS data). The intent was to count each unique patient contact, which is not a number recorded anywhere. Multiple meetings and conversations with the Medical Director resulted in an imperfect, but reasonable estimate of 12,450 unique patient contacts in 1999.

Calculations were also made to estimate the cost per contact with members of the target population. The cost per target population member used the same cost number, but extracted from the SNIS forms all visits by unique children under five as well as prenatal visits by unique women. This results in a somewhat conservative estimate because it shrinks the definition of a woman in the target population from one of child bearing age to one who is pregnant and presents for prenatal care. However it is a reasonable estimate and the best the data will allow.

Additionally, a theoretical cost per individual receiving full vitamin A coverage and full vaccination coverage (PAI/VA) was calculated. This was done by holding the costs and number of patient contacts constant but assuming the target coverage rate was achieved. This number is helpful when comparing various strategies for achieving the target coverage rates.

Each of these numbers was recalculated using a "modified" direct cost. This modified cost excludes the cost of delivering specific medical services. (Specifically it excludes the cost of the ambulance service and the cost of medical consumables.) This produces the fixed cost of staffing the clinic. If you then assume the marginal cost of VAC and PAI to be zero (not strictly true, but helpful for the sake of demonstration) then the "Modified Total Cost per Target Contact" provides one theoretical estimate of what it would cost to provide the most basic services. (Implicit in this estimate is that about 30% of target population visits would come from outside urban Yapacani. In the future this number can be tested empirically using the customer service survey in appendix III.) This number, taken together with the "Modified Total Cost per Full PAI/VA" provides two different ways of estimating the cost of meeting the coverage targets.

Mobile Team: The same method was used for the mobile team as for the clinic. Again, personnel was the largest single costs, though by a narrower margin given the added cost of the vehicles and the more dispersed population being served. The indirect cost of CEPAC HQ overhead was also included at a rate estimated by the senior financial manager. Coverage data was tabulated from

various ad hoc reports and provided by the medical director. Missing data was handled in various ways: In some cases missing data was believed to reflect actual activities (or lack of activities) and in some cases simple reporting errors. The final numbers used resulted from a combination of assumption and while they represent the most reasonable estimates, and are adequate for the purpose of this analysis, they are not believed to be precise.

With the exception of the modified cost analysis, which was not repeated for the mobile team because the variation from full costs was insignificant, all analysis carried out on the clinic data was repeated with the mobile team data. Additionally scenario analysis was completed varying in one case the frequency of community visits and in the other the size of the mobile team going forward. This prospective analysis is designed to assist CEPAC in their planning of future service expansions.

Festivals: The use of festivals is a new method of delivering health services for CEPAC. On a rotating basis CEPAC will go into a community for three days. The first two, consisting of community outreach and training, are run by staffers hired specifically to develop and disseminate training materials at the festivals. On the third day clinical personnel arrive to provide care. Additionally the festivals include entertainment, such as games and music, in an effort to draw the largest possible number of attendees. The financial data needed to analyze the effectiveness of the festivals is available, though they are budget rather than expenditure data. However CEPAC has not yet organized an effective method for collecting and reporting coverage data. As a result adequate coverage data was not available for the completion of a retrospective analysis. Instead, the analysis is a prospective breakeven analysis using the mobile team's cost of patient contact as the benchmark. The budgeted annual cost of the festivals was divided by the per patient cost of the mobile teams to determine the number of patients that must be attended to at the festivals for the two modes of service to be of equal efficiency.

Results and Recommendations:

Results are expressed as cost per patient contact both historically and prospectively. The intention of these data is not to draw direct comparisons with other projects, or even between the different modes of service delivery, but rather to provide benchmarks to be used by CEPAC as they plan service expansions. It is also expected that CEPAC will use the models provided to complete similar analysis as a part of their ongoing project monitoring. The intention of the analysis is not to prescribe a particular course of action to CEPAC, but rather to elucidate their current situation, and provide insight into future scenarios.

This analysis provides a high level benchmark for future spending and helps provide context for the other results. The two given variables are dollars available to spend and individuals to be cared for. The analysis simply makes clear what resources are available per person and what resources are available if only the target population is considered.

Clinic: As described in the Methods section the analysis was completed and the following results obtained:

The analysis indicates that CEPAC is currently spending about $.3.25 per patient contact and $8.65 per contact with members of the target population. However at this expenditure level they are achieving coverage rates far below the USAID targets established in the CS proposal. Using CEPAC's current coverage rate and extrapolating, the total cost per Full PAI/VA was estimated to be over $25. This number may be a bit unfair however. The current coverage rate used was the rate for all of Yapacani, while the clinic serves, primarily, urban Yapacani where they have achieved substantially higher coverage rates. While there are certainly steps that could be taken to improve clinic operations, they would entail simply optimizing operations within the current strategy rather than a dramatic strategic shift. The real strategic shift will be required to serve the rural population in a more effective manner either through the mobile teams or through expanded use of the health festivals.

The modified cost analysis was completed in an attempt to strip out the costs of providing specific patient care, to demonstrate the cost of simply staffing the clinic. If the clinic were to change strategies and begin to focus exclusively on the highest impact interventions, PAI/VA, then the cost of providing just those services would approximate the results above. (This assumes the marginal cost of PAI/VA to be zero. Using capsules and vaccines supplied by the MOH, this assumption is within a few cents of being correct.) This information is helpful only as a benchmark to help CEPAC think about their operations: it is well documented that CS projects provide PAI/VA for a dollar per person per year (2 doses). CEPAC's services are much more costly. This is in no way an indictment of CEPAC, merely a helpful benchmark to remember as CEPAC plans service expansions.

Mobile Team:

Patient Contacts		2,190
Target Patient Contacts		882
Direct Expenditures	$	37,825
Direct Cost per Contact	$	17.28
Direct Cost per Target Contact	$	42.89
Indirect Costs	$	13,085
Total Cost per Contact	$	23.25
Total Cost per Target Contact	$	57.72

This analysis demonstrates that, on a per contact basis, the mobile team is far more costly than the clinic, and far more costly than the maximum expenditures produced by the top-line analysis. Additionally, despite this high per contact cost, VA/PAI coverage rates are extremely low in the rural areas. The challenge then is how does CEPAC serve a much larger number of people without increasing, and perhaps decreasing, total expenditures. There are several strategies that would make this possible. Two are analyzed below:

Mobile Team Scenarios						
Visit Frequency Varied						
Frequency of Visits	Communities Covered	% Com. Covered	Patient contacts	Direct Costs	Total District Covereage	Cost per Full PAI/VA
Monthly	30	29%	2,190	$ 37,825	23%	$ 54.52
Bi-Monthly	60	57%	2,190	$ 37,825	46%	$ 27.26
Quarterly	90	86%	2,190	$ 37,825	69%	$ 18.17
Tri-Annually	105	100%	2,190	$ 37,825	80%	$ 15.58
Team Size Varied						
Tri-Annually	105	100%	2,190	$ 37,825	80%	$ 15.58
Tri-Annually	105	100%	2,190	$ 29,620	80%	$ 12.20
Tri-Annually	105	100%	2,190	$ 20,206	80%	$ 8.32

The easiest and quickest way of increasing coverage rates would simply to visit each community less frequently. As the table above indicates CEPAC is currently covering only 29% of the communities in Yapacani, but doing so on a monthly basis. As a result they are spending over $54 per full PAI/VA. By re-deploying existing resources, far more individuals could be reached. If CEPAC were to shift to a tri-annual visit schedule, expenditures and total patient visits could stay constant, but coverage rate could rise to the target level of 80% and cost per full PAI/VA would fall by 71.4% to $15.58. In addition to these gains, there is reason to believe that this new strategic direction would have corollary benefits. Specifically, if the mobile team visited communities less frequently, it is very reasonable to assume that a greater percent of the community would attend each visit. If this were to happen, the total number of patient contacts would rise, rather than remaining constant. This increase in patient contacts would represent an increase in the productivity of the medical personnel and an improvement in the health of the population.

There are, of course, downsides to less frequent visits. A larger number of acute events would inevitably require individuals to travel to health posts rather than wait for the mobile team, and follow up treatment (of a broken bone that had been set for example) would suffer. One strategy for mitigating at least a portion of this downside would be to take greater advantage of the RPSs. With additional training the RPSs may be able to fill part of the gap left by the less frequent mobile team visits and it may even be possible to help them distribute needed drugs at a nominal cost actually improving the sustainability of the project. Additionally, the frequency of the visits has allowed the mobile team to establish close, personnel relationships with many of their patients. This too would suffer from less frequent visits.

A second quick way of reducing the cost of mobile team services would be to reduce the size of

the team. The team is currently composed of six individuals including a physician, two nurses, a social worker and a driver, plus a supervisor that accompanies the team one or two days a week. This team serves an average of 15-20 patients per day. This is by most measures a very high worker/patient ratio. In the table above title "Team Size Varied" the first line represents the current team size. Line two the team minus the physician and the final line a team made up of a nurse, driver and social worker. If this minimum size team were employed unit costs would fall by nearly 50%. Taken together with the new schedule, unit costs would fall from $54.58 to $8.32 for total savings of 85%. Resulting in both a substantial saving of resources and hundreds of saved lives.

It is true that the smaller team would not deliver exactly the same level of care. However if CEPAC is to change its focus from the delivery of acute care services to a public health focus of delivering preventative services, a smaller team can certainly carry out this new mission. This idea was discussed with Widen Abastoflor who seems open to making changes.

Festivals: The festivals are designed as outreach to provide both health services and education to the most rural areas of Ichilo. The population they serve is most like the population served by the mobile team and therefore the mobile team is the best comparison.

This analysis highlights the breakeven point between the effectiveness of the festivals and the effectiveness of the mobile teams. That is, given the cost and coverage of the mobile team as stated in this report, and taking the budgeted cost of the festivals, we can say that if CEPAC has 30 festivals per year they need to provide medical services to 78 people in order to be just as cost-effective as the mobile teams. If they see more than 78 then they will be more cost-effective. Of course any of the variables can be changed as needed. (As costs go up or down for example.)

There is one important element not included in this analysis: education. In addition to providing direct medical care, both the mobile team and the festivals provide health information. The relative reach and effectiveness of the training provided by these two methods could impact the final decision regarding the relative cost-effectiveness of various service delivery methods.

Quality of Data Collecting and Reporting: If data collected by CEPAC is to be used to perform CEA and to optimize the allocation of resources, to help medical personnel of the project better understand the needs of the communities served, or in any other way inform project decision making, then it is important that the data be collected accurately and reported in a useful and flexible manner. Though the project does a good job of collecting key data, there seem to be significant opportunities for improving the collection, and most importantly the reporting of data to make it more useful to CEPAC managers, medical staff as well as facilitating reporting to CEPAC funders**.**

Conclusion:

The health services program of CEPAC appears to be a well-run program providing high quality services to its patients. However, its focus remains clinical: treating and healing individuals with less emphasis on prevention. As a result the population is not receiving the most high impact services. The challenge facing CEPAC, and IEF, is to balance what has been good and successful about CEPAC, especially its strong relationships with the communities it serves while changing its orientation towards population based services and evaluation; away from treatment and towards prevention.

Relative to public health programs, such as CS programs, CEPAC is a high cost service provider. In the coming years CEPAC must employ new strategies that allow for more patients to be treated, without increasing expenditures. This is going to require the abandonment of some high price/low impact service and the re-deployment of those resources to low cost/high impact interventions. It may require changing the personnel mix of the project (more nurses and fewer physicians for example). Whatever specific tactics CEPAC decides to employ, it seems clear that there are a variety of ways that the coverage goals established in the original proposal can be met given the existing budget.

Cost-Effectiveness Analysis: An Overview

What is Cost-Effectiveness Analysis (CEA)?

Cost-effectiveness analysis is the determination of a unit cost of a particular activity. CEA simply takes the cost of an activity and divides that cost by some unit of effectiveness. For example it may cost one thousand dollars to immunize two thousand children leaving us with a cost-effectiveness ratio of fifty cents or expressed differently, we determined that it costs fifty cents to vaccinate each child. Cost-effectiveness analysis is not the same as cost-benefit analysis. (CBA) Cost-benefit analysis always involves the comparison of currency denominated costs with currency denominated benefits. That is to say project X cost Y dollars and provided Z dollars in benefits. In order to make these currency based comparisons, the effectiveness measurements need to be converted to currency terms: X dollars for a saved life Y dollars for a case of pneumonia averted, etc. This is beyond the scope of CEA.

Once the unit cost has been determined the decision making process is not over, but rather just beginning. CEA is not intended to set policy, but rather to provide decision-makers with useful information as they set policy. It is one piece of information to be used and interpreted by a knowledgeable manager. (See example below.) In theory it would be possible to compare the CEA done on a vitamin A capsule distribution project in Nepal with a vaccination campaign in Honduras, and simply fund the one with the lower unit cost. In practice a variety of other factors need to be considered.

Proper Uses of CEA:

As mentioned above, CEA is not an end in itself but rather a tool to assist managers. CEA is most effective when: it is used to compare extremely similar interventions; used to compare distinct means to a common end; used to compare project performance over time.

In 1997 a cost-effectiveness study of a Child Survival project in the Cobán province of Guatemala evaluated the distribution of vitamin A capsules. This particular project used several different methods of distribution in an attempt to achieve the highest possible coverage rates. One method used was to send extentionist to villages to dose newly post-partum women who did not give birth at the regional hospital (where they would have received a capsule). 719 women were dosed with VA, and the cost of dosing these women was about $8,500. CEA allows us to compare these facts with a second mode of distribution employed by the same project. The analysis indicates that to reach one portion of the target population (these 719 women) it cost $11.68 each, but to distribute 14,977 capsules to children under six, and 2,572 capsules to women giving

birth in the hospital, the cost was only $8,190 or 47 cents each. This is an example of CEA being applied effectively and providing valuable information to a project manager. Note that this information does not imply a course of action. One might argue that $11.68/woman is so much more expensive than the $.47 that the intervention should be dropped and the resources re-allocated. But one could also argue that the marginal cost of $11.68/woman is still quite low given the benefits, and that the intervention should continue. The final decision can only be made by a well-informed manager with access to all the needed facts.

While it is important to recognize the power of CEA, in order to apply it properly, it is equally important to recognize its limitations. Two major limitations include the level of analysis and intensity of intervention.

Intensity of Intervention:

Take for example two health projects each designed to improve health indicators in a particular village. Project A reports spending $1,000 per village and project B reports a cost of $2,000 per village. Without additional information it seems clear that project A is more efficient. In truth, however, we might discover that project A distributes vitamin A capsules, while project B distributes capsules, provides nutrition counseling, and full immunization to all members of the village. Given this additional information it is no longer possible to compare the projects directly, because the intensity of their interventions is dissimilar. In order to make a direct comparison one would need to move from measuring the process indicators (capsules distributed, immunizations provided, etc.) to the impact indicators such as illnesses and deaths averted. While this is possible, it is difficult and expensive, and beyond the scope of simple CEA.

Level of Analysis:

The analogy most frequently used to describe levels of CE analysis is the stream. Money is spent at the top of the stream, and various results occur downstream. For example, money is spent on nutrition education, causing various results downstream: lectures are presented; women attend the lectures; consumption of vitamin A in the population increases; cases of acute respiratory infection are averted; QALYs (quality adjusted life years) are saved.

Clearly the upstream results are the easiest to measure, and the downstream results the most difficult. The choice of what is appropriately measured is an important one. In many ways the further downstream results are the most interesting, but will generally be difficult or even impossible to calculate accurately.

The upstream/downstream indicators are sometimes termed process/impact indicators. The logic to this is clear: an upstream or process indicator is a reflection of the activities of a project: the

number of lectures presented, children vaccinated or latrines dug. They are usually objectively determined, reliable figures. The downstream or impact indicators are such factors as number of individuals reaching vitamin A sufficiency, cases of disease averted or deaths prevented. These figures are more likely to be the subjective results of some type of analysis and are infrequently available for use in simple CEA.

When deciding upon the level of analysis, it is very tempting for the ambitious manager to want to analyze the impact of projects very far downstream. It is important to keep in mind the difficulties that might be faced. Generally speaking, unless one has very specific, sophisticated statistical training.
It should be process indicators that are analyzed, though not as powerful as analysis of impact indicators the rapidity and ease with which process indicators can be analyzed allows managers to receive useful information without burdensome expenditures of time or cash.

The Analysis Process:

Establish Costs:

When the time comes to begin the actual analysis the first step is to calculate the costs of the entire project. For most projects labor will be the largest expense and then there will be other expenses such as supplies, tools, gasoline, vehicle maintenance, etc. Taken together these costs will represent the direct project expenses. Purchases of large pieces of equipment that the project will use for more than a year, such as a vehicle, should be calculated as a capital expense and amortized over its useful life.

One decision that will need to be made is the level of costs to be included. Does one include just the direct labor and materials required to carry out an intervention (What economist call marginal costs, and cost accountants call variable costing) or all costs that are part of a project (total costs or absorption costing). Thinking specifically of CEPAC should the cost effectiveness of the mobile teams measure just the team personnel, the vehicles and supplies, or should overhead such as HQ staff salaries be factored in as well? Generally it is less important which of these expenses is included, than it is to be clear about what is and is not included, and that the same types of expenses are included or excluded consistently every time analysis is conducted. Generally marginal costs are most useful and the expenses measured will be the direct project expenses including amortized capital expenses, but not overhead and HQ. However the decision is strictly a managerial one based on what information will be helpful. Often times it is easy to report several different cost layers in a simple table format. For example:

	Costs	Children Covered with VAC	Cost per Child
Direct Field Costs	$1,000	2000	$.50
Indirect Field Costs	$ 400		
Total Field Costs	**$1,400**	**2000**	**$.70**
HQ Overhead	$ 200		
Total Costs	**$1,600**	**2000**	**$.80**

This allows all the relevant information to be displayed and managers to easily distinguish between various cost levels depending on their needs.

Allocate expenses to appropriate interventions:

Once relevant costs are tabulated for a project, it is necessary to allocate them amongst the interventions being evaluated. This is easiest in projects with relatively few interventions and projects where a single input (in most cases labor) is the dominant expense. In any case, some reasonable model for allocating expenses must be devised. The model is a simple one. If the project being evaluated has interventions X and Y then it follows that:

Total Cost (TC) * % resources devoted to X = TC of X.

There are a couple of ways to create the allocation table, in general the process is to look carefully at the largest expenditures, and be sure to allocate them properly, and then simply expand that model to cover the remaining expenses. That is to say if 80% of project expenses are from labor, then most of the other expenses should be allocated in the same way labor is. So if 17% of the labor on a project goes to intervention A, the approximately 17% of the gasoline expense should be allocated to intervention A. Adjustments can then be made to individual line items based on managerial knowledge. Time sheets, broken down by intervention, are an easy way to keep track of labor resources devoted to various interventions.

Relate allocated costs to measurable events (Unit Cost):

Unit costs = TC/activity.

Once the cost is determined, a measure of effectiveness must be decided upon. (When one is planning the analysis prospectively, the indicators should be set in advance.) The question should be asked, "what did these funds pay for"? It may be a number of people trained, number of patients treated or one of many objective measures of productivity. While looking at expenditures

for a particular time period allows us to put a price tag on particular services, it is the cost of the project over time, relative to fundamental impacts, that is the true measure of success for the project.

While there are a variety of different ways that this type of analysis can be done, and all sorts of interesting models that one might create to help get at cost allocations, it is important to not lose sight of what are ultimately terribly simple questions: how much money was spent? What was it spent on? How can we measure the impact of those expenditures? Those are really the three questions that should be at the heart of any cost-effectiveness analysis. Once these decisions are made, it is important that the needed data be collected as planned, and that the original decisions remain unchanged unless absolutely necessary. One of the real benefits of CEA will be the ability to compare interventions from one year to the next. If there are changes in the indicators analyzed or in the methodology, some or all of this benefit could be lost. For example, if a project were to track the number of capsules distributed and number of immunizations provided during the first two years of a project and then, perhaps because of an upgrade in their data collection and reporting systems, was to begin tracking the number of children under five receiving full, annual PAI/VAC coverage, the data would not be comparable between years one and two, and the subsequent years. Even though the full coverage data is further downstream and in some ways more useful than the simple distribution data, the discontinuity in the indicators detracts from the overall value of the data. In that case it would be appropriate to collect the coverage data, but also to continue to collect the distribution data so that it could be directly compared with previous years.